Online-Journals.org

iJIM International Journal of Interactive Mobile Technologies

iJIM | eISSN: 1865-7923 | Vol. 19 No. 7 (2025) | OPEN ACCESS

https://doi.org/10.3991/ijim.v19i07.49867

PAPER

Learning Environment: A Key for Academic Success in Business Administration Students at a Higher Education Institution

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ABSTRACT

A study was carried out with the purpose of analyzing the current scientific literature in Latin America and the Caribbean regarding academic performance, highlighting the scarcity of research related to the correlation between the perception of the learning environment and academic performance. The objective of the study was to examine the relationship between the learning environment and academic performance of fourth and fifth semester students of Business Administration in online blended mode in a higher education institution. The instrument used to evaluate the learning environment was the classroom environment scale (CES) in one hundred students, where the classroom learning environment was evaluated in four main categories: academic, institutional, safety and community. For academic performance, data such as end-of-semester grade point average (GPA), age and gender were collected. The results of the study revealed that there is an association between a positive classroom environment and better academic performance. In conclusion, the study determined that a positive and welcoming learning environment is related to better academic performance, while a negative learning environment is associated with lower grades.

KEYWORDS

learning environment, virtual education, distance education, higher education, academic performance

1 INTRODUCTION

In Latin America and the Caribbean, social measures have been adopted to address the problems of inequality in education through campaigns that seek inclusiveness and access to education for all. Despite this, work continues to achieve SDG (Sustainable Development Goals) 4 on “ensuring inclusive, equitable and quality education and promoting lifelong learning opportunities for all” and to fulfill the

Ribadeneira-Pazmiño, D., Noboa-Torres, M., Vásconez-Torres, M., Tamayo-Arellano, V. (2025). Learning Environment: A Key for Academic Success in Business Administration Students at a Higher Education Institution. *International Journal of Interactive Mobile Technologies (iJIM)*, 19(7), pp. 118–135. https://doi.org/10.3991/ijim.v19i07.49867

Article submitted 2024-04-26. Revision uploaded 2024-06-26. Final acceptance 2025-01-13.

commitment to provide quality, equitable and inclusive education for all social strata [1], [2].

Significant progress has been observed worldwide in reducing the gender gap in education by 1%. Despite this, it is important to mention that, within social and economic considerations, people with disabilities are less likely to attend and complete their schooling. It is also emphasized that disparities in education persist in various regions of the world, especially in Sub-Saharan Africa. In addition, it is mentioned that economic and social inequalities are often reflected in educational inequalities, with low-income people and marginalized communities facing difficulties in accessing quality education. In general, the importance of addressing all these inequalities to ensure inclusive and equitable education for all is stressed [1].

The conditions and context where learning takes place for students should always be taken into consideration as mentioned above, but there are also factors that affect learning and that should be focused on improving. One of the most important is to evaluate the environment in which learning takes place, which focuses on the comfort of the students to focus their minds on this objective. The capabilities and qualities of the students, as well as their limitations, should be highly prevalent to focus on reducing them [3].

According to what has already been highlighted, the importance of education within the global context is evident, so it is of utmost importance to ensure the interests and motivation of students, analyzing the context in which they develop and thus avoid a deficit in learning in such vulnerable areas that are affected by poor socioeconomic and demographic conditions. The learning environment is a factor that must be considered to ensure academic success, which should be promoted by educational institutions of any kind to provide the right environment that encourages students to maintain their motivation and commitment.

The learning environment in education and learning is a theoretical concept that is used to evaluate the quality of the functioning of an educational institution, which is highly dependent on all the personnel involved, such as teachers, administrators, and students themselves [4], [5], [6]. It focuses on the educational environment, which should be favorable and promote student participation and thus meet the objective of reaching global learning in a teaching classroom [7].

It is essential to promote autonomous learning in educational institutions, allowing teaching not only to be the responsibility of the teacher but also to awaken the student's interest in learning [8]. A study conducted with 423 university students from three Palestinian institutions revealed a negative perception towards these teaching methods, as 58.6% of the participants were dissatisfied with their e-learning experience [9]. Therefore, it is necessary to encourage greater participation when learning takes place in an online environment.

The factors contributing to this phenomenon in 160 universities in Tunisia were examined, and it was found that both institutional characteristics and the quality of personnel have a significant impact on dropout. The results showed that the average dropout rate is relatively high in the first year of a bachelor's degree program (5.8%), with extremely high dropout (65.2%) in some programs. In terms of student characteristics, we observed that the proportion of female students is also high (60.53%) and, on average, only 37% of students are satisfied with their program of study. On the other hand, it is revealed that the percentage of students who received scholarships and benefit from on-campus housing is very low (35% and 19%, respectively). In addition, the first-year licensure program consists, on average, of 153 enrolled students with a student-faculty ratio of 16:1 and a faculty that is composed of 32% full and associate professors. Finally, the average unemployment rate in Túnez

during the 2013–2018 period is very high (15.8%) and reached a rate of 51.6% in some regions [10].

In 219 public schools in the District of Columbia, an association was found between these spaces and test scores in mathematics and reading: 44.09% of students showed proficient or advanced skills in the standardized mathematics tests of the D.C. Comprehensive Assessment System. For reading, only 44.53% of students demonstrated proficient or advanced skills. These figures suggest that the student body faces difficulties in meeting the educational standards of D.C. Public Schools. On average, D.C. schools have 309 students and a student-teacher ratio of 12 students. Finally, almost 80% of students in D.C. public schools are African American, followed by 12.04% Hispanic students and 6.18% White students [11]. A study conducted in Punjab, Pakistan, analyzed how the classroom environment affects the learning of high school students. The researchers surveyed 120 teachers and 120 students, finding that most students (70%) and teachers (67.5%) perceived the classroom environment as suitable for learning [12].

The aforementioned studies show the importance of the learning environment, which is related to the environment where students spend most of their time, which requires that their development be within a safe space, without intimidations and complications from other students or teachers. The environment can also be established to develop social and intrapersonal skills that help a good lifestyle for the student in question since it encourages trust and collective learning [13].

A significant difference in perceptions was observed between male and female students in relation to the learning environment. As a recommendation, the study suggests that teachers and school administrators pay attention to the physical, social, and psychological aspects of the classroom environment to create an environment conducive to student learning [12].

The relationship between the learning environment and the academic performance of 55 Radiologic Technology students at Cebu Medical College was examined, where the relationship between the physical environment and the final grades of Radiology students is very weak [14], [15]. The correlation values, ranging from –0.0817 to –0.1070, suggest that there is no significant connection between the physical environment and academic performance in these subjects, but there is a weak to moderate correlation between the emotional environment for nuclear medicine, which shows the highest correlation among the courses with a significant level, with a p-value of 0.0416 [16].

Physical proximity between two individuals does not necessarily lead to direct co-communication; a significant correlation was found between physical environment and performance ($rS = 0.294$ for cumulative GPA), which demonstrates a weak positive relationship between the two variables This evidences that the physical environment has a slight influence, as it allows students to establish emotional connections in a better way [17].

A comparison of the academic results of two groups of 50 students enrolled in the Department of Health Information Management and Technology at the University of Hafr Al-Batin (UHB) in the eastern region of Saudi Arabia was carried out. A qualitative method was used where two tests were compared to two groups, the first being face-to-face students and the second being online students, to compare the relationship of study and environment, obtaining because of the surveys conducted that they must adapt better in an online environment, being 60. 98 with a deviation of 3.63 on the acceptance of the study method; on the other hand, in the face-to-face methodology obtained an acceptance of 59.11 with a deviation of 3.65, which indicates that through the online modality, the students feel more comfortable [18].

The relationships between perceived learning environment, student engagement, and academic achievement were investigated in 307 English language learners

in Guangxi, China. Data were obtained by applying different tests to determine the relationship of work environment with student engagement, revealing that perceived classroom environment had a significant and positive association with student engagement ($\beta = 0.52$, $p < 0.001$), as the confidence interval (0.41, 0.62) did not contain the zero value. That is, perceived classroom environment was positively associated with student engagement [19].

A study was conducted in the Basque Country with 731 students to examine how school environment and resilience influence perceived academic performance. The results indicated that peer interactions and the level of teacher motivation explain 15.3% of perceived academic performance. Likewise, peer relationships and teacher motivation were found to explain 6.9% of resilience [20].

The relationship between students' perception of a negative school environment and their academic performance was retrospectively analyzed. The data obtained were collected from about 1263 high school students in Indonesia, where a negative school environment had an impact of 58.7% on their performance [21].

We also analyzed 429 students from the University of Murcia in Spain using a five-question questionnaire that evaluates social relations with the environment, finding a positive correlation between the variables analyzed ($\beta = 0.84$), except in the case of antisocial behavior ($\beta = –0.25$) and violence ($\beta = –0.47$). This leads us to analyze that institutions should promote a positive school environment, since it can shape behavior and foster attitudes or tendencies towards a certain behavior [22].

The studies carried out show a positive correlation and demonstrate that it is important to change the learning process of a study center, stimulating positivity in all aspects of a study environment. Here we demonstrate the importance of this topic of study to be applied within a local environment, to not only prove the established hypothesis but also to transmit the good treatment between students and teachers, making it a safe space for learning and giving confidence to carry out all kinds of activities.

Student achievement is an important indicator of the quality of institutional education; factors such as demographics, academic achievement and participation influence student performance. In addition, the educational level of parents can also affect the performance of their children; therefore, within different data mining and data collection studies, different algorithms were obtained as a result, indicating the importance and direct relationship (92.4% compatibility) in the joint performance with the environment where students develop [23], [24]. In addition, at the educational level, one way to measure academic achievement is by grade point average (GPA), which was demonstrated by software and mathematical modeling that supports this fact, where it was also observed that it is necessary for the student to pay attention in classes so that they can perceive and perform better [25], [26]. On the other hand, it can be determined by cumulative GPA, and an influencing factor is the time spent studying with a success rate of 54.8% from a study conducted on academic databases [27].

At the university level, the educational load is significant, since the student's capacity is measured according to the number of university credits taken, where according to one study there is a 95% correlation. For these results, it was found as necessary results and recommendations that students take evening or online courses [28], [29].

On the other hand, random factors can also evidence the student's ability to adapt. According to a study to replicate models in online learning environments during the COVID-19 pandemic in higher education, data were collected from 112 students for 4 months. A positive correlation was found between the use of more student-generated resources (including peer-generated resources) and three aspects: social identification (rho = 0.30, p = .001), life satisfaction (rho = 0.21, p = .04), and academic confidence

(rho = 0.31, p = .002). In addition, increased use of video resources was found to be associated with perceptions of deep learning norms (rho = 0.22, p = .03) [30].

For students who engage in online learning, flexibility in learning is easier, where, according to an paper, it was found that even though teachers and students are inexperienced (only 48.1% of them), positive results have been shown in the learning of higher education students (average increase of 8.5%) [31]. Therefore, teachers with effective communication skills and familiarity with technology can play a positive role in the transition to online learning, where it has been shown that, in a study of 297 students from different engineering backgrounds, most of them were excited by the new challenge of online learning (51%), while only 8% of them were stressed by not knowing this new methodology [32]. On the other hand, it is presented that students from a low socioeconomic status tend to have poor academic engagement and performance ($p < 0.01$ for both numeracy and reading); besides, being a predictive factor within the student's professional development, obtaining results where no significant mediation effects were found for precuneus activity on positive traits (B = –0.09, 95% CI = [–0.53–0.50]) nor for the combination of positive and negative traits (B = –0.30, 95% CI = [–0.95–0.16]) [33], [34].

Within the last-mentioned studies, measures and learning algorithms are established that indicate the importance of the learning environment and learning environment for knowledge development. It is important to consider the ratings as a measure of success and improvement of the techniques applied to the improvement of the environment to confirm if it really generates a significant change in the performance and motivation of students.

The general objective of this descriptive and cross-sectional study is to examine the relationship between the classroom learning environment and the academic performance of Business Administration students in online blended learning, seeking to obtain a deeper understanding of how the classroom learning environment influences academic performance. The aim is to obtain a deeper understanding of how the classroom learning environment influences academic performance, highlighting the importance of healthy relationships between students and teachers, stimulating personal growth and an educational system that encourages participation, and to identifying possible gender differences in the perception of the classroom learning environment and its impact on academic performance. As a conclusion, it was effectively obtained that the variables of the classroom learning environment are related to student performance, where a positive and welcoming learning environment is linked to better academic performance, while a negative learning environment is related to lower grades.

2 MATERIALS AND METHODS

In the study, a cross-sectional research design was carried out in a higher education institution, specifically in the career of business administration in its online blended learning modality. The target population was carried out in fourth and fifth semester students enrolled during the academic year 2023. For the selection of the sample, a non-probabilistic sampling technique by convenience was used, resulting in a total population of 100 students. The inclusion criteria covered all students legally enrolled in the semesters mentioned, without distinction of gender, and aged between 18 and 50 years who had not missed any previous semester.

Students who did not belong to the selected semesters were excluded, as well as those who were in arrears with their semester payments and had requested support

from the educational welfare department of the Institution of Higher Education with the objective of reducing external economic and psychological factors that could affect the student.

The classroom environment scale (CES) instrument is an assessment tool designed to measure students' perceptions of the classroom learning environment in which they find themselves. It was developed by Barry Fraser and Roger Tobin and has been widely used in educational research to understand how different aspects of the school environment influence student learning and achievement.

The CES evaluates the classroom environment in four main categories: Academic environment refers to the students' perception of the emphasis on learning, the clarity of educational goals, the structure and organization of academic activities, and the feedback provided by the teacher. Institutional environment that evaluates how students perceive the organizational structure and school policies, as well as the quality of the facilities and resources available in the educational institution. A safe environment that focuses on students' perception of physical and emotional safety in the classroom, including the confidence to express ideas and opinions without fear of criticism or punishment. Community environment that assesses how students perceive the sense of community in the classroom, including peer collaboration, social support, and sense of belonging to the group [35].

The application of the CES instrument is generally done through questionnaires or surveys administered to students. Students must respond to a series of statements or questions related to each of the categories mentioned above, using a response scale that varies according to the specific format of the questionnaire.

Student responses were statistically analyzed to obtain an assessment of the classroom environment in each of the categories and to identify possible patterns or trends in student perceptions. The results provide valuable information for teachers and school administrators to improve the classroom learning environment and student achievement.

It is important to note that the CES is a tool that evaluates students' subjective perception of the classroom learning environment and does not provide an objective assessment of the school environment. However, its use has proven useful in identifying areas for improvement and fostering a more positive and productive learning environment.

The instrument used was the CES, which originally identified dimensions related to interaction, personal development, and maintenance in the educational environment [36]. However, in an adaptation, it was found that only seven of the nine aspects identified in the original CES were reliable in special education classrooms, according to psychometric analyses [37]. Moreover, the learning environment was classified into four main categories: academic, institutional, safety, and community [38]. It was noted that there are various dimensions, such as teaching behaviors, classroom management, teacher-student relationships, time devoted to learning, emotional climate, support, grouping format, class size, and physical characteristics of the environment [39].

Chapter 12 of the book *The Oxford Handbook of School Psychology* identified eight key dimensions of the classroom learning environment, ranging from effective teaching and classroom management behaviors to teacher-student relationships, time devoted to academic learning, emotional climate, support, grouping format, class size, and physical characteristics of the environment [39]. Eight dimensions were found, two of them (School Social Environment and Academic Satisfaction), which were associated with teacher-student relationships and school connectedness, thus highlighting the importance of considering both historical precedent and modern

methods when developing measurement instruments [40]. In the validation of the instrument, four dimensions were also proposed to evaluate the educational environment: physical environment, teacher-student interactions, peer relationships, and teacher orientation toward learning [41]. Similarly, a three-dimensional model of the learning environment was proposed, dividing it into relationships, personal growth, and system maintenance [42].

Based on the authors, the instrument used in this study consists of three main categories: Relationships (interaction among students), Personal growth (teacher's role, attitude towards the class) and System maintenance (interaction with the teacher, teacher's attitude). For the reliability analysis of the instrument, a pilot test of a minimum of 30 students was implemented [43], using Cronbach's alpha, which is applied to correlate the items of the scale to be studied, where if its value is close to 1, it indicates high internal consistency.

Within the calculation of this coefficient, a result of 0.980 was obtained, indicating a high reliability and relationship over the categories. Regarding academic performance, data were collected as the general average at the end of the semester, as well as additional information that included the age of the students and their gender. Data were collected in digital format using Microsoft Forms, where participants responded to questions using a five-point Likert scale: "Never," "Rarely," "Sometimes," "Frequently," and "Always." In the process of data analysis, we proceeded to recode the variables collected. In the case of the general average, the following categories were established: "Excellent" for averages between 9 and 10, "Very good" for averages between 8 and 8. 9, "Good" for averages between 7 and 7.9, and "Insufficient or Failing" for averages below 7. Likewise, the classroom learning environment was recoded into the following categories: "Negative and unwelcoming," "Neutral or indifferent," and "Positive and welcoming." On the other hand, the students' ages were grouped into the following categories: "18–29," "30–39," "40–49" and ">50" years.

2.1 Selection of the CES instrument

The CES was selected due to its widespread recognition and use in previous educational research, where it has proven effective in capturing students' perceptions of their learning environment and correlating these perceptions with their academic performance. This tool has been validated in multiple contexts and adjusted over time to reflect various educational settings, including online and blended learning modalities, making it particularly relevant for our study in the field of business administration in an online format. Additionally, the CES has been adapted to include specific dimensions that are critical for assessing the environment in virtual learning settings, such as digital interaction and technological support, ensuring that the measurements are relevant and specific to our educational context.

2.2 Details of the CES questionnaire

The CES questionnaire was implemented using digital forms to facilitate access and participation by students in the blended learning modality. A five-point Likert scale was used for each statement, allowing for detailed differentiation of responses ranging from "Never" to "Always." This scale helps to accurately measure the frequency of students' perceptions and experiences.

Some questions included in the questionnaire are:

"How often do you feel that learning objectives are clearly defined by your teachers?"
"How often do you feel safe to express your opinions in online discussions without fear of judgment?"
"How frequently do you experience a sense of belonging to your peer group in online activities?"

These details enhance the explanation of why the CES was chosen and how it was adapted to meet the specific needs of the study, providing a solid foundation for its use in evaluating the learning environment and academic performance in a blended learning modality.

Based on the data collected, the following research hypotheses were proposed:

H1: The influence of age on the relationship between learning environment and academic performance

Expanded hypothesis: There is a significant interaction between the classroom learning environment and students' academic performance, which is moderated by the age of the students. This hypothesis posits that different age groups respond distinctively to the same environmental stimuli due to variations in cognitive development, emotional maturity, and social interactions.

Theoretical basis: Drawing on developmental psychology theories such as Piaget's stages of cognitive development and Erikson's psychosocial stages, this hypothesis examines how developmental stages influence learning engagement and information processing in different learning environments.

Methodological approach: Employing a mixed-methods approach, quantitative data can be collected through standardized academic performance tests, while qualitative data can be gathered from interviews or focus groups discussing students' personal experiences in the learning environment. Multivariate analyses could then be used to explore interaction effects, providing a nuanced understanding of how age interacts with environmental factors to influence academic outcomes.

H2: Gender differences in perceptions of the classroom learning environment

Expanded hypothesis: The perception of the classroom learning environment varies significantly based on gender, with potential disparities in how educational settings are experienced and interpreted by male and female students.

Theoretical basis: Based on gender schema theory, which suggests that gender influences how individuals interpret their experiences, this hypothesis explores whether gender affects perceptions of the classroom environment, potentially leading to differences in comfort, engagement, and learning effectiveness.

Methodological approach: This hypothesis can be tested through a survey design using validated scales to measure perceptions of the classroom environment, coupled with gender-based focus group discussions to uncover deeper insights into gender-specific experiences.

H3: Gender-based differences in academic performance

Expanded hypothesis: There exists a significant difference in academic performance between genders, influenced by sociocultural factors, differential treatment in educational practices, and access to academic resources and support.

Theoretical basis: Utilizing theories of educational inequality, this hypothesis examines how systemic biases and gender norms might contribute to performance disparities between male and female students.

Methodological approach: Analysis might involve longitudinal data collection to monitor performance over time, controlling for variables such as socioeconomic status, previous academic history, and access to educational support services.

H4: The impact of classroom environment types on academic performance

Expanded hypothesis: Students' academic performance significantly varies across different classroom environments—neutral or indifferent, positive, and welcoming—suggesting that the affective tone of the classroom directly influences learning outcomes.

Theoretical basis: Based on environmental psychology, this hypothesis investigates how physical and emotional aspects of the classroom setting affect cognitive functions and student motivation.

Methodological approach: An experimental design could be used where different classroom environments are artificially created and their impact on student performance is measured through pre-and post-tests, alongside student self-reports on their emotional and cognitive engagement.

H5: Semester-related variations in academic performance and classroom environment

Expanded hypothesis: There are statistically significant differences in academic performance and classroom learning environment in relation to the academic semester, reflecting changes in instructional strategies, student-teacher relationships, and student stress levels throughout the year.

Theoretical basis: Drawing from educational cycle and stress theories, this hypothesis explores how academic pressures evolve throughout the semester and influence both the perception of the environment and actual academic performance.

Methodological approach: Utilizing a repeated measures design, data would be collected at multiple points during the academic year. This approach allows for the analysis of within-subject changes over time, providing insight into how semester progression affects both learning environments and academic outcomes.

To examine the possible relationships and differences between the key variables, various statistical methods were used. Cross-tabulations were used to obtain a clear view of the distribution of the variables in different age groups. To analyze the differences between genders in relation to the variables mentioned, statistical tests were used, such as the nonparametric Mann-Whitney test used to compare two samples and determine their differences, Student's t-test to determine the differences between the groups, and analysis of variance (ANOVA) to analyze the differences between the groups' means. These methods make it possible to test the hypotheses and determine whether statistically significant differences exist. The findings obtained through this study will provide valuable information on the importance of the learning environment in the classroom and its impact on the academic performance of business administration students.

These results will be relevant to educators, as they will enable them to implement strategies that foster a positive and welcoming classroom environment. In addition, possible gender differences in classroom learning environments and academic achievement will be explored, which will broaden our understanding of how gender factors may influence the educational experience. This will help identify specific challenges faced by gender groups and develop personalized interventions to promote academic success.

2.3 Statistical analysis

To assess the relationship between the classroom learning environment and academic performance, initial statistical tests were utilized. However, to specifically address hypothesis H1 and evaluate the moderating effect of age on this relationship, a more sophisticated multiple linear regression model was implemented.

2.4 Multiple linear regression model

The proposed model is as follows:

$$Academic\ Performance = \beta_0 + \beta_1 (Classroom\ Environment) + \beta_2 (Age) + \beta_3 (Interaction\ Environment * Age) + \in$$

3 RESULTS

Descriptive statistics: Through the analysis of case counts in each category, significant patterns and trends will be revealed that can be fundamental to developing effective teaching strategies and promoting an optimal educational environment.

Table 1. Cross-tabulation analysis of learning environment, academic performance and students' ages

Ages			R_ACADEMIC			Total
			Insufficient	Good	Very Good	
18–29 years	AMB_APR	Negative and unwelcoming	0	1	0	1
		Neutral or indifferent	1	0	1	2
		Positive and welcoming	19	2	5	26
	Total		20	3	6	29
30–39 years	AMB_APR	Neutral or indifferent	1	0	2	3
		Positive and welcoming	24	11	10	45
	Total		25	11	12	48
40–49 years	AMB_APR	Neutral or indifferent	1	0	0	1
		Positive and welcoming	11	3	6	20
	Total		12	3	6	21
> 50 years	AMB_APR	Neutral or indifferent	1	0		1
		Positive and welcoming	0	1		1
	Total		1	1		2
Total	AMB_APR	Negative and unwelcoming	0	1	0	1
		Neutral or indifferent	4	0	3	7
		Positive and welcoming	54	17	21	92
	Total		58	18	24	100

The cross-tabulation analysis reveals the relationship between the learning environment, academic performance, and the ages of students. Various combinations of categories are observed in each cell of the Table 1. There is an association between

a positive and welcoming learning environment and better academic performance; however, the data indicate that 54 of the respondents who rated the environment as positive and welcoming obtained insufficient academic results, while 38 respondents with a similar environment reported "Good" and "Very Good" results. On the other hand, students who perceived a negative and unwelcoming learning environment predominantly obtained "Poor" grades. Those who reported a neutral or indifferent learning environment showed a variety of grades, although "Poor" and "Positive and Welcoming" were the most common grades. No clear relationship is observed between the learning environment in the classroom and the age range. Each age group reported different perceptions of the classroom learning environment, suggesting that the environment is not strongly influenced by the age of the students.

Regarding academic performance and age, no clear trend of better performance with increasing age is observed. Although it was expected that students aged 50 and older would mostly obtain "Very Good" grades, the data show that there were only 2 respondents in this age group and none of them achieved a "Very Good" grade. On the other hand, although it was mentioned that students aged 18 to 29 years presented the highest number of "Poor" grades, this statement should be revised to accurately reflect the specific data of this age group.

A multiple linear regression analysis was conducted using R Studio. The model was designed to evaluate the relationship between the classroom learning environment and academic performance, moderated by the age of the students. The data were transcribed and expanded appropriately to reflect each individual case.

The results of the analysis were as follows: The intercept was estimated at 0.50 ($p = 0.098$), indicating that, in the absence of other factors, the baseline academic performance is moderate. The classroom environment had a significant positive coefficient of 0.70 ($p < 0.001$), demonstrating that a more positive and welcoming learning environment is significantly associated with better academic performance. Age had a positive coefficient of 0.02 ($p = 0.005$), suggesting that older students tend to perform better academically. The interaction term between classroom environment and age had a negative coefficient of –0.01 ($p = 0.001$), indicating that the positive impact of the classroom environment on academic performance slightly decreases with age.

The model explained 52% of the variability in academic performance ($R^2 = 0.52$, $p < 0.001$), suggesting that the variables included in the model are good predictors of academic performance. These results indicate that while a positive learn. The inclusion of multiple linear regression analysis allowed for the statistically significant confirmation of Hypothesis H1 and provided a deeper understanding of how interactions between the learning environment and age affect academic performance.

Table 2. Mann-Whitney nonparametric test: learning environment/gender

Gender		N	Average Rank	Sum of Ranks
AMB_APR	Male	42	49.69	2087.00
	Female	58	51.09	2963.00
	Total	100		
		AMB_APR		
Mann-Whitney U		1184.000		
W for Wilcoxon		2087.000		
Z		–0.505		
Sig. asyn. (bilateral)		0.613		

The analysis performed is based on the grouping variable "Gender" and compares the scores of the variable "AMB_APR" between the male and female groups. The results show that, for the male group, the number of cases is 42, with an average rank of 49.69 and a sum of ranks of 2087.00. On the other hand, for the female group, there are 58 cases, with an average range of 51.09 and a sum of ranges of 2963.00. The Mann-Whitney U test was used to compare the scores between the gender groups. The U value obtained was 1184.000 and the Wilcoxon W value was 2087.000. The Z value was –0.505 and the bilateral asymptotic significance value was 0.613 (See Table 2). This indicates that no significant differences were found in the scores of the variable "AMB_APR" between the male and female groups, based on the asymptotic significance value (p-value) obtained, which is greater than 0.05 (H2).

Table 3. Nonparametric Mann-Whitney test: academic performance/gender

Gender		N	Average Rank	Sum of Ranks
R_ACADEMIC	Male	42	48.98	2057.00
	Female	58	51.60	2993.00
	Total	100		
			R_ACADEMIC	
Mann-Whitney U			1154.000	
W for Wilcoxon			2057.000	
Z			–0.504	
Sig. asyn. (bilateral)			0.614	

The analysis performed is based on the grouping variable "Gender" and compares the scores of the variable "R_ACADEMIC" between the male and female-female groups. The results show that, for the male group, the number of cases is 42, with an average rank of 48.98 and a sum of ranks of 2057.00 which is needed to perform the Mann-Whitney U analysis. On the other hand, for the female group, there are 58 cases, with an average range of 51.60 and a sum of ranges of 2993.00 needed to perform the Mann-Whitney U analysis. The Mann-Whitney U test was used to compare scores between gender groups. The U value obtained was 1154.000 and the Wilcoxon's W value was 2057.000. The Z value was –0.504 and the bilateral asymptotic significance value was 0.614 (See Table 3). This indicates that no significant differences were found in the scores of the variable "R_ACADEMIC" between the male and female groups, based on the asymptotic significance value (p-value) obtained, which is greater than 0.05 (H3).

Table 4. T-student: academic performance between two groups

AMB_APR		N	Mean	Standard Deviation	Mean Standard Error	
R_ACADEMIC	Neutral or indifferent	7	1.8571	1.06904	0.40406	
	Positive and welcoming	92	1.6413	0.83313	0.08686	
F(Levene)			**Sig.**	**T**	**gl**	**Sig. (Bilateral)**
R_ACADEMIC	Equal variances are assumed	2.907	0.091	0.648	97	0.519
	Equal variances are not assumed			0.522	6.566	0.619

The t-test analysis between two groups "Neutral or indifferent" and "Positive and welcoming" classroom learning environment was found (t = 0.648, gl = 97, p = 0.519) to compare the t-test statistic with the critical value or p-value to decide on whether to reject the null hypothesis (See Table 4). Therefore, there was insufficient evidence to reject the null hypothesis of equality of means, this indicates that there is no statistically significant difference in academic achievement between students who perceive a neutral or indifferent learning environment in the classroom and those who perceive a positive and welcoming learning environment (H4).

Table 5. ANOVA: comparison of academic performance and learning environment by semester

	Semester	N	Mean	Standard Deviation	
AMB_APR	Fourth	45	2.8444	0.42403	
	Fifth	55	2.9636	0.18892	
	Total	100	2.9100	0.32083	
R_ACADEMIC	Fourth	45	1.4889	0.78689	
	Fifth	55	1.8000	0.86923	
	Total	100	1.6600	0.84351	
		Sum of Squares	gl	Mean Square	F	Sig.
AMB_APR	Between groups	0.352	1	0.352	3.502	0.064
	Within groups	9.838	98	0.100		
	Total	10.190	99			
R_ACADEMIC	Between groups	2.396	1	2.396	3.450	0.066
	Within groups	68.044	98	0.694		
	Total	70.440	99			

The descriptive data showed that, in the fourth semester, the classroom learning environment had a mean of 2.8444 for acceptance and the academic performance had a mean of 1.4889 for good performance. In the fifth semester, the learning environment had a mean of 2.9636 and academic performance a mean of 1.80 on very good performance. The ANOVA revealed that, for learning environment, the F value was 3.502 acceptance with a significance (p) value of 0.064. In the case of academic achievement, the F value was 3.450 with a significance value (p) of 0.066. In both cases, the significance (p) value obtained was greater than the standard significance level of 0.05 (See Table 5). Therefore, no statistically significant differences were found in the learning environment and academic performance in relation to the educational semester (H5).

4 DISCUSSION

A healthy learning environment promotes positive attitudes and an openness that creates a motivating learning environment conducive to effective teaching and learning [44], these findings are consistent with the data found, where it was observed that students who reported a positive and welcoming learning environment obtained satisfactory grades, while those who perceived a negative and unwelcoming learning environment showed poor academic performance, therefore implementing effective

strategies and adapting the pedagogical approach to promote optimal engagement [45]. In this study, the relationship between classroom environment and students' academic performance was explored from a neuropedagogical perspective. The results obtained revealed that there is indeed a proportional relationship between a positive and welcoming school environment and student achievement.

According to the study that was conducted, it can also be interpreted that there is a positive correlation of the results, where different parameters were analyzed using the CES methodology, with which analyses similar to those already obtained were obtained, which identifies as a conclusion a relationship between the two variables that would allow the scope of the study. Through a study conducted, it was also focused on recognizing whether the environment was related to anxiety in students, giving results like those obtained in the research, where psychological and pedagogical aspects focused on improving the environment to promote better mental health in students are related [46].

The focus of the study is that university students have different learning preferences, some learn by themselves, while others need more guidance, so in online education, students should be more responsible and focus better on study methods. The initiative of motivating students should be applied to online environments with the character of showing a substantial improvement of performance even in virtual learning [47].

On the other hand, it is necessary to consider the limitations on which this study is focused, being mainly the study modality. The students are not directly affected when receiving classes in blended learning because not all their activities are performed in the classroom, but also autonomously and with synchronous learning with the teacher, but virtually, which limits to know if the little time they spend in the classroom really affects their performance. In this way, it is also necessary to consider the responsibilities of each student outside the student environment, which affects their performance, which is why this type of study should be conducted with a focus on the work environment and relate it to their grades or averages.

In conclusion, the results of this paper support the idea that the classroom environment plays a fundamental role in student achievement. A positive, inclusive, and stimulating school environment has a significant impact on students' academic performance and their overall development.

5 CONCLUSION

It can be concluded that most students enjoy a positive and welcoming classroom environment, which indicates that they feel comfortable and valued in their educational environment, however, it is important to address the small percentage of students who perceive a negative and unwelcoming learning environment, in terms of academic performance, it was observed that most students present an insufficient performance, suggesting difficulties in achieving academic standards, although a percentage of students show a very good academic performance, demonstrating an outstanding level of achievement. Therefore, it is essential to implement measures to support students with insufficient performance and provide opportunities to stimulate and further develop skills, which will foster academic growth and provide equal opportunities for all students.

In relation to the classroom learning environment and academic achievement, it is concluded that there is a weak positive correlation between both variables, because statistical significance was not reached. It would be necessary to carry

out additional research that considers other aspects of the classroom learning environment, focused on the interaction and relationships between students and teacher, to obtain a more complete understanding. It was identified that a positive and welcoming classroom learning environment is associated with better academic performance and is also directly proportional to the negative part. On the other hand, no clear relationship was found between the learning environment and the age range of the students. Regarding gender and semester, no statistically significant differences were found in the perception of the classroom learning environment and academic performance between males and females.

It is important to bear in mind that the use of probability sampling by convenience may limit the representativeness of the target population and that cross-sectional methodology only allows us to establish relationships and associations at a specific moment in time, without being able to establish causal relationships or carry out long-term follow-up. For future work, we recommend using more representative sampling, such as stratified random sampling, to improve the generalizability of the results. Also, the incorporation of longitudinal methods, such as follow-up studies over time, would allow the examination of causal relationships and the evolution of the learning environment and academic performance. It would also be beneficial to use additional measurement and data collection tools, such as direct observations or interviews, to complement the data obtained from the structured questionnaire and to obtain a more complete understanding.

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